

SWABEY  
OGILVY RENAULT  
S E N C

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The Assistant Commissioner for Patents  
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Re: NEW – Patent Application  
"WIRELESS COMMUNICATION WITH  
HEADER SUPPRESSION AND  
RECONSTRUCTION"  
Inventor: Yvon BERGERON  
Our reference: 14786-1US JA/AA

Sir:

Enclosed herewith for filing with the United States Patent and Trademark Office, is a new nonprovisional patent application and the particulars are as follows:

APPLICANT                    Yvon BERGERON  
                                  Montreal, Quebec, CANADA

The following documents are enclosed:

Disclosure – pages 1 to 16  
Claims – pages 17 to 21  
Abstract – page 22  
Unsigned Combined Declaration & Power of Attorney  
Drawings – Figs. 1 to 7

We look forward to receiving the Notice to File Missing parts in due course.

Respectfully submitted,



James Anglehart, Reg. No 38,796  
Agent of Record  
SWABEY OGILVY RENAULT  
Suite 1600, 1981 McGill College Avenue  
Montreal, Québec, CANADA H3A 2Y3

Encls.: as mentioned above

ROBERT MITCHELL  
GUY J. HODGE  
PAUL MARCOTTE  
KEVIN P. MCLELLAN  
JOHN D. MCLELLAN  
ROBERT CANTIER  
MICHEL SOFIA  
FRANÇOIS CÔTÉ  
CÉLINE TREMBLAY  
MAX R. WOOD  
JAMES ANGLEHART  
PAUL J. FIELD  
PATRICIA SÉGUIN  
WAYNE YAN  
FRANÇOIS NADEAU

JOAN CLARK, QC  
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MALCOLM E. MCLEOD  
J. NELSON LANDRY  
DANIEL J. LACK  
PAULINE E. KILRANE  
CLAUDE RHUETTE  
TERRENCE J. McMANUS  
DANIELLE BOUTET  
KENNETH E. SHARPE  
JUDITH ROBINSON  
DANIEL S. DRAPEAU  
GEORGE K. LOCKE  
BRIAN DALLY  
LEIGH D. CROWFOOT  
*Administrator*  
JAMES A. FRASER

ALAN SWABEY (1969-1999)  
MILVIN SIEBEL (1935-1994)

A FIRM IN WHICH SWABEY MITCHELL,  
OGILVY MARCOTTE CÔTÉ AND  
THE LAW FIRM OGILVY RENAULT  
ARE PARTNERS

# WIRELESS DATA COMMUNICATIONS WITH HEADER SUPPRESSION AND RECONSTRUCTION

## FIELD OF THE INVENTION

5 The present invention relates to wireless data communications with header suppression and reconstruction, and in particular to a network gateway and a wireless terminal communications manager. More precisely, this invention describes a TCP/IP wireless gateway for enabling mobile users to have its own IP address.

10

## BACKGROUND OF INVENTION

No one can anymore doubt about the increase of wireless communications between individuals. Meanwhile, if a lot of work has been done in the field of cellular communications, lots remains to be done in wireless communications involving data. In fact, it is important for a mobile user to be able to wireless communicate using his computer and a cellular phone for instance. Several solutions exists already. Meanwhile, they suffer from various limitations.

For instance, there exists wireless LAN cards (NOKIA C110 Wireless LAN card for instance) which uses PCMCIA interface to access a wireless LAN. This type of card suffers from a few limitations. The user must use the frequency of the LAN card to communicate with a hub and therefore the user cannot use his own radio system to transfer data. In the case of the NOKIA system, the typical range indoors is 30/90m.

Furthermore, the system uses a Dynamic Host Configuration Protocol (DHCP) meaning that the IP address of the mobile is not static. This can be a serious drawback when the user wants to access a service where part of the authentication is done using a fixed IP address rather than a range of IP addresses. The encryption of the data is done using an up to 128-bit key (using Wired Equivalent Privacy protocol). It would be interesting to use any type of encryption scheme.

Another prior art technique is the use of a cellular modem in the case of an analog cellular protocol, such as AMPS. The cellular modem is usually a PCMCIA type card that the user will insert in the mobile computer. This cellular modem is then connected to a cellular telephone allowing the mobile computer to

- 5 be connected to the analog cellular network. In the case of a digital cellular network, a modem is not necessary as the computer and the phone both work in digital mode. Only Terminal Adapter Equipment (TAE) is required to link the cellular phone to the computer. An Infra Red (IR) interface can be used to do so in the case that the mobile computer and the mobile are both IR compliant.
- 10 In both cases, the user can then access, using the dial-up link, a data network. For instance, the user can connect to an ISP to obtain either a static or a dynamic IP address depending on the user's account. The user can also connect to his office using NetBEUI protocol. While the radio protocol has specific compression/encryption schemes, no compression/encryption procedure is done
- 15 prior to the transmission of the data over the cellular phone. This is a serious issue, especially if the cellular transmission is intercepted.

Therefore there is a need for an architecture that will avoid the shortcomings of the relevant prior art.

## SUMMARY OF INVENTION

It is an object of the present invention to provide a gateway that can link a group of wireless users using the TCP/IP protocol.

5 Another object of the present invention is to provide static IP addresses for each wireless users of a network.

It is another object of the invention to provide a minimisation of the packet overhead used to communicate between wireless users.

10 Yet another object of the invention is to provide a compression of the packet used to communicate between the wireless users.

Yet another object of the invention is to encrypt the packets used to communicate between the wireless users.

Yet another object of the invention is to maintain a list of the active mobile users in a radio network.

15 Yet another object of the invention is to keep track of and to protect all packets used by the wireless users to communicate.

Yet another object of the invention is to be able to broadcast information to all mobile users of a wireless network.

20 Yet another object of the invention is to compile communication statistics related to wireless users.

According to one aspect of the invention, there is provided a gateway for transmitting data packets between a wireless network and a second network, the gateway comprising a database comprising data associating at least one wireless terminal with at least one destination address, the data including for 25 each of at least one wireless terminal at least one wireless terminal identifier, at least one source address of the wireless terminal according to a protocol of the second network, and at least one destination address on the second network, a database manager collecting information from the data packets received from at least one wireless terminal in order to build up and maintain the database, a 30 header builder receiving data packets from the wireless network without a header suitable for the protocol of the second network and building the suitable header

based on the data and information contained within the data packets received, and outputting data packets with the suitable header for transmission on the second network and a relay module receiving data packets from the second network addressing at least one wireless terminal according to an address

5 associated with the second network, the relay module retransmitting the data packets from the second network to at least one wireless terminal using an address obtained from the database in a format of a protocol of the wireless network.

According to another aspect of the invention, there is provided a wireless

10 terminal for transmitting wireless packets over a wireless network, the wireless terminal comprising a header manager transmitting header information for a particular destination on a second network, and the wireless packets to the wireless network without a header suitable for a protocol used on a second network, a memory comprising data representing header information concerning 15 at least one second network terminal, a memory manager collecting information from the wireless packets received from the wireless network in order to build up and maintain the memory, a relay module collecting the data packets, not having a header suitable for the protocol, from the wireless network to build a data packet with a header suitable for the protocol using the data.

20 According to another aspect of the invention, there is provided a method for sending a data packet from a wireless terminal to a second network via a wireless network, the method comprising the steps of sending header information from the wireless terminal, removing the header of the data packet to provide a data part of the data packet, adding to the data part of the data packet a wireless 25 header to provide a wireless packet, transmitting the wireless packet over the wireless network, receiving the wireless packet and removing the wireless header of the wireless packet to provide the data part of the wireless packet, creating a header for the data part using the header information received and according to a protocol of the second network, adding the header created to the 30 data part of the wireless packet to provide a new packet, and sending the new packet on the second network.

According to another aspect of the invention, there is provided a method for sending a data packet from a second network to a wireless terminal via a wireless network, the method comprising the steps of sending header information from the second network to the wireless terminal, removing the header of the

5 data packet to provide a data part of the data packet, adding to the data part of the data packet a wireless header to provide a wireless packet, transmitting the wireless packet over the wireless network, receiving the wireless packet and removing the wireless header of the wireless packet to provide the data part of the wireless packet, creating a header for the data part using the header

10 information received by the wireless terminal and according to a protocol used at the wireless terminal, and adding the header created to the data part of the wireless packet to provide a new packet in the protocol.

## BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood by an examination of the following 5 description, together with the accompanying drawings, in which:

**Fig. 1** shows an overview of a wireless network using the invention; a group of mobile units can communicate with a server which acts as a gateway to a remote server.

**Fig. 2** shows the functional architecture of the invention; the invention 10 comprises a wireless gateway connected to another network and a mobile client.

**Fig. 3** shows the detailed architecture of the preferred embodiment of the invention for a mobile unit.

**Fig. 4** shows the format of the packet that can be transferred.

**Fig. 5** shows the block diagram which represents actions performed by 15 the gateway upon reception of a wireless packet.

**Fig. 6** shows the block diagram which represents actions performed by the gateway upon reception of a TCP/IP packet.

**Fig. 7** shows an embodiment of the database which comprised ID numbers and Sub ID numbers.

## PREFERRED EMBODIMENT

While the present invention may be provided in various embodiments, there is shown in the drawings and described in the following text a specific preferred embodiment, with the understanding that the present description is only one embodiment and is not limiting of the scope of the invention.

5 **Fig. 1** illustrates one embodiment of the invention. The system, in the preferred

embodiment is a gateway that allows TCP/IP communications between wireless users. More precisely, in the preferred embodiment of the invention, a wireless network comprises a server node 17 and several client nodes 16. In the preferred

10 embodiment, the network can be an ARDIS network. In this example, there are

three client nodes 16. Each client node 16 comprises a mobile computer 12 and a radio system 10 that is, in the preferred embodiment, a cellular phone. Each radio system 10 is connected to a mobile computer 12 via a cable 11. The server

15 node 17 comprises a server computer 13, a radio transceiver 14 and a connection to another network 15. In the preferred embodiment the link 15 to a foreign network is a cable. It can also be a wireless connection. In the preferred

embodiment each client node 16 is able to communicate with the server node 17. In the preferred embodiment, the server computer 13 is an Intel Pentium II running at 350MHz, with 128MB of Random Access Memory (RAM) and 3 GB of

20 hard drive space. In the preferred embodiment, the server computer 13 runs under Microsoft Windows NT4.0. In the preferred embodiment, the mobile computer is an Intel Pentium running at 133 MHz with 32 MB of RAM which runs under Microsoft Windows 98 or Microsoft Windows NT4.0.

### General description

25 Now referring to Fig 2, the complete architecture of the system is disclosed. A mobile unit 21 is able to communicate with a network 19 using a wireless gateway 20.

The mobile unit 21 comprises a TCP/IP application 27 which is either a client application or a server application. A client application could be a telnet 30 application, while a server application could be a Web Server application such as Apache web server. The mobile unit 21 also comprises a TCP/IP stack 28 whose

goal is to ultimately create TCP/IP packets. The mobile unit 21 also comprises an IP/WIRELESS, WIRELESS/IP translator 29 whose goal is to at least convert, according to a specific scheme, an IP packet into a wireless packet in the case of an outgoing communication or a wireless packet into an IP packet in the case of

5 an incoming packet. The mobile unit 21 also comprises a data-radio transceiver 30 which can either receive information from an antenna 31 in the case of an incoming signal, or send information to an antenna 31 in the case of an outgoing signal.

The gateway 20 allows a mobile unit 21 to communicate with another mobile unit

10 21 of the same wireless network. The gateway 20 also allows a mobile unit 21 to communicate with at least one computer located in a part or a sub part of the network 19. The gateway 20 also allows at least one computer located in a part or a sub part of the network 19 to communicate with at least one mobile unit 21 from the wireless network.

15 The gateway 20 comprises a router whose goal is to route incoming and outgoing traffic. More precisely, the router can allow at least one computer located in a part or a sub part of the network 19 to communicate with at least one mobile unit 21. The router 22 accesses a database 24 which contains information concerning the active mobile units 21 with their physical address, their TCP/IP

20 related information, their Identification Number (ID) and their Sub Identification Number (Sub ID). An entry of the database 24 is shown in Fig 7. An ID number 160 is linked to at least a TCP/IP address 161 and a physical address 162. This ID number 160 can also be linked to Sub ID numbers 163, these Sub ID numbers are linked to at least destination TCP/IP address 164. These Sub ID numbers are

25 also linked with the source port 165 and the destination port 166 used for the communication. The router 22 is also connected to an IP/WIRELESS, WIRELESS/IP translator 23. The goal of the IP/WIRELESS, WIRELESS/IP translator 23 is to at least convert, according to a specific scheme, an IP packet into a wireless packet in the case of an outgoing communication or a wireless

30 packet into an IP packet in the case of an incoming packet according to the database 24. The IP/WIRELESS, WIRELESS/IP translator 23 is connected to a

data-radio transceiver 25 which can either receive information from an antenna 26 in the case of an incoming signal, or send information to an antenna 26 in the case of an outgoing signal.

### **Header Translation**

#### **5 Connection of a mobile user 21 to the wireless network**

In order to communicate in the wireless network, a mobile user 21 has an ID number. This ID number is given by the gateway during the first connection of the mobile user 21 to the gateway 20.

More precisely, during the first connection to the gateway 20, the mobile user 21

10 send its hardware address which is unique and the desired IP address. Upon reception of this unique wireless packet (step 121 Fig 5) which comprises the hardware address and in the case that the choice of the IP address is feasible (i.e. the IP address is not already taken), the mobile user 21 is given an ID number (step 123 Fig 5). In the preferred embodiment, this ID number is not 15 static meaning that it is not fixed. This ID number and the received hardware address of the mobile user 21 are stored into database 24 (step 124 Fig 5).

The ID number is sent to the mobile unit 21 (step 125 Fig 5) and stored in the memory of the IP/WIRELESS, WIRELESS/IP translator 29. A group of Sub ID numbers are linked to a specific ID number. The Sub ID numbers refer to a 20 specific connection (i.e. one link between two peer users). While the ID number corresponds to a specific mobile unit connected, the combination between an ID number and a Sub ID number refers to a unique connection between a mobile unit 21 and a TCP/IP user.

#### **Process to send information from a mobile unit**

25 A mobile unit 21 with an application 27 is willing to communicate with another computer located either in the wireless network or in the network 19. The application 27 sends information using path 42 to the TCP/IP stack 28. This information comprises for instance the type of service requested, the IP address of the computer to reach and the data to transmit.

30 Upon reception of this information, the TCP/IP stack 28 performs the creation of the TCP/IP packets which comprises this information plus information such as

checksum control. The TCP/IP stack 28 then sends to the IP/WIRELESS, WIRELESS/IP translator 29 this packet using path 44. The IP/WIRELESS, WIRELESS/IP translator 29 then checks if an ID number is available for the mobile unit 21. If not, the connection of the mobile user 21 to the wireless network, as described before, is performed. If an ID number is available, the IP/WIRELESS, WIRELESS/IP translator 29 checks in its memory if the destination IP of the packet is already known i.e. if a Sub ID number exists. If no Sub ID number exists, the IP/WIRELESS, WIRELESS/IP translator 29 transfers a packet which comprises as data the TCP/IP header of the packet to send and a wireless header. If a Sub ID exists, the wireless packet is prepared with the data part of the TCP/IP packet.

The wireless packet is sent to the data radio transceiver 30 using path 46. The radio transceiver converts this packet into a radio signal that is sent to the antenna using the antenna link 31. The signal is received by the gateway 20. The signals goes to the data radio transceiver 25 of the gateway 20. The data radio transceiver 25 of the gateway 20 converts the radio signal into a flow of data which is a packet. This packet goes to the IP/WIRELESS, WIRELESS/IP translator 23 of the gateway 20. Upon reception of the packet (step 121 Fig 5), the IP/WIRELESS, WIRELESS/IP translator 23 sends a request to the database 24 using the path 38. This request comprises the ID and the Sub ID (if this applies) contained in the packet. The IP/WIRELESS, WIRELESS/IP translator 23 receives then from the database 24 a response (step 122 Fig 5) which contains either TCP/IP information in the case that a Sub ID is available or a flag signaling that no IP information is available in the database 24 in the case that there is no Sub ID transmitted to the database 24. In the case that no TCP/IP information is available in the database (i.e. no Sub ID are available), a Sub ID (step 128 Fig 5) is created. This Sub ID and the TCP/IP header information part of the data contained in the packet which comes from the data radio transceiver 25 via path 37, are sent to the database 24 (step 129 fig 5). This Sub ID number will be transmitted to the mobile unit 21 (step 130 Fig 5). In the case that a Sub ID exists, TCP/IP information related to this specific Sub ID are transmitted to the

IP/WIRELESS, WIRELESS/IP translator 23. A new TCP/IP header is created using this TCP/IP information and the data field contained in the radio packet. This new TCP/IP data packet is sent to the router 22 using path 35. The router routes the packet according to flexible policies determined by a user. If the 5 packet destination is outside the wireless network i.e. in the network 19, the router checks whether the destination IP address is allowed. If so, the TCP/IP packet is sent to the network 19 using the link 33. If the packet destination is inside the wireless network, the router 22 checks in the database 24, by making 10 a request using path 38, if the user IP exists. Furthermore, in another embodiment, the router 22 checks if the destination user, in the case that the destination user is connected, allows the source user to reach him. A way to implement that would be for instance to add a field in the database next to the destination IP address which would contain either banned addresses or authorised addresses. In the case that the destination user is a mobile unit part 15 of the wireless network, the packet is sent to the IP/WIRELESS, WIRELESS/IP translator 23 for further processing.

Process to send information from the gateway to the mobile

When a TCP/IP packet is to be sent by the gateway 20 to a mobile unit 21, the IP/WIRELESS, WIRELESS/IP translator 23 makes a request to the database 24 20 using path 38. The request comprises the destination IP address. In return, the database 24 sends back the ID number to be used. If no Sub ID are related to the IP destination address, a Sub ID number is created. This Sub ID number is linked to the source IP address.

A packet which comprises this Sub ID, the ID, and TCP/IP information is created 25 by the IP/WIRELESS, WIRELESS/IP translator 23. This packet is sent to the data radio transceiver 25 where it is converted into a radio signal which is transmitted to the antenna using the antenna link 26.

If a Sub ID related to this source TCP/IP address already exists, the ID and Sub 30 ID numbers are retrieved from the database 24 and used with the data part of the TCP/IP packet to create a wireless header that will be used to create a wireless packet. Such wireless packet is sent to the data radio transmitter 25 using the

path 36. This wireless packet is then converted into a radio signal which is sent to the antenna using the antenna link 26. This radio signal is received by all antennas of the wireless network.

Each mobile unit 21 receives this radio signal which is transmitted to the data

- 5 radio transceiver 30 using the antenna link 31. The data radio transceiver 30 then converts this radio signal into a flow of information that will form wireless packets. In the preferred embodiment, this flow of information is digital. The wireless packet is then sent to the IP/WIRELESS, WIRELESS/IP translator 29. The IP/WIRELESS, WIRELESS/IP translator 29 then checks whether the ID number
- 10 is the one corresponding to this particular mobile unit 21. If the ID number does not correspond to this particular mobile unit 21, the packet is discarded. If the ID number corresponds to the one of this particular mobile unit 21, the IP/WIRELESS, WIRELESS/IP translator 29 checks into its memory whether he knows the Sub ID number. If not, this means that this packet contains information
- 15 to initialize a new Sub ID created by the gateway 20, in its data field. This information comprises the TCP/IP address of the source. In the case that no prior Sub ID exists, the information is uploaded in the internal memory of the IP/WIRELESS, WIRELESS/IP translator 29. If the sub ID number is contained into the memory of the IP/WIRELESS, WIRELESS/IP translator 29, the
- 20 IP/WIRELESS, WIRELESS/IP translator 29 retrieves from its memory the IP parameters in order to create the TCP/IP packet using the data part of the wireless packet transmitted. This TCP/IP packet is now sent to the application 27 using path 43.

In another embodiment, the IP/WIRELESS, WIRELESS/IP translator 23 and the

- 25 IP/WIRELESS, WIRELESS/IP translator 29 performs encryption/decryption and/or compression/decompression of the data part of the wireless packet. In another embodiment, the IP/WIRELESS, WIRELESS/IP translator 23 and the IP/WIRELESS, WIRELESS/IP translator 29 performs encryption/decryption and/or compression/decompression of the data part of the whole wireless packet.
- 30 More precisely, the mobile unit 21 decides which encryption key will be used and transmits this information to the gateway 20. The encryption key used by one

particular mobile unit 21 will be stored in the database 24 during the first connection. Thus, this allows each mobile unit 21 to have its own encryption key.

The type of compression algorithm currently used is preferably sent by the gateway 20 to the mobile unit 21. This type of compression algorithm will be used

5 between the gateway 20 and the mobile unit 21 in further communications. While these protection/compression schemes allow the transmission of the information in a public packet oriented network with a lower bandwidth, the amount of processing time on each side will larger.

In the preferred embodiment, the transmission of the data packets sent over the

10 wireless network is managed by the IP/WIRELESS, WIRELESS/IP translator 23 on the gateway side and the IP/WIRELESS, WIRELESS/IP translator 29 on the mobile user side. The IP/WIRELESS, WIRELESS/IP translator 23 and the IP/WIRELESS, WIRELESS/IP translator 29 check the transmission of the wireless packets over the wireless network. They command their respective radio 15 transceiver in order to synchronise communication, send acknowledgements, request reception acknowledgements in the case that the acknowledgements are not received, save wireless packets if they cannot be immediately sent.

Fig 5 summarises the action performed by the WIRELESS/IP, IP/WIRELESS translator 23 when receiving a wireless packet, in the preferred embodiment. Fig

20 6 summarises the operation performed by the WIRELESS/IP, IP/WIRELESS translator 29 when receiving a TCP/IP packet.

#### Another embodiment of the system, under a Microsoft architecture

Now referring to Fig 3, the complete architecture of the system is disclosed. The

25 TCP/IP application 60 is either a client application or a server application. These applications can use either Remote Procedure Call (RPC) or Winsock library (version 1.1 and 2.0). Wsock32.dll 61 is a library provided by Microsoft. This library allows a program which uses it to select a socket and to send data using either UDP or TCP protocol to an IP address. The socket emulation kernel level

30 62 creates the TCP/IP packet at the kernel level of the operating system. The Network Driver Interface Specification (NDIS) 63 allows a high level of

abstraction and portability under Microsoft Windows environment. In fact, more precisely, NDIS describes the interface by which one or more Network Interface Card (NIC) drivers communicates with one or more underlying network interface cards, with one or more overlying protocol drivers, and with the operating system.

5 The invention is a network interface card which comprises a network manager 72 named RRDRV.sys and an executable application 73 named RRWIN32.exe. The network manager 72 comprises a miniport NDIS 64 which directly manages the network interface card 74. The network manager 72 also comprises a driver part 66 and a buffer 65. The network interface card 74 also comprises the executable 10 application 73 which comprises a main thread 69, a second thread 67 and a buffer 68. The interface 70 allows the invention to be interfaced to a packet radio system 71. The main thread 69 is responsible for compressing and encoding the packets. It is also responsible for sending the packets to the packet radio system 71 via the interface 70. The second thread 67 is responsible for waiting for new 15 packets that the NDIS 64 gives incoming traffic. More precisely, there are four types of communication between the executable application 73 and the network manager 72.

The first type of communication between the executable application 73 and the network manager 72 refers more precisely to a communication between the miniport NDIS 64 and the second thread 67. The goal of this communication is to inform the second thread 67 of the arrival of a packet on the NDIS 64. The second thread 67 does a connection to the NDIS using path 87.

The second type of communication between the executable application 73 and the network manager 72 refers more precisely to a communication between the 20 driver 66 and the main thread 69. The main thread 69 can send data to the driver 66 using data path 89.

The third type of communication between the executable application 73 and the network manager 72 refers more precisely to a communication between the 25 driver part 66 of the network manager 72 and the second thread 67. The second thread 67 can get data from the driver part 66 of the network manager 72 using data path 88.

The fourth type of communication is between the interface 70 and the main thread 69. The main thread 69 sends information to the interface 70 using the data path 97; the main thread 69 received information from the interface 70 using the data path 98.

- 5 In order to allow communication between the miniport NDIS 64 and the driver part 66 of the network manager 72, a buffer 65 stores temporary data. In the preferred embodiment, the buffer 65 comprises 500 single buffers of 2000 bytes length each. The buffer 65 communicates with the miniport NDIS 64 using data paths 83 and 84. The buffer 65 communicates with the driver part 66 of the network manager 72 using data paths 85 and 86.

The main thread 69 can communicate with the second thread 67. The main thread 69 does communicate with the radio system 71 via the interface 70. The main thread can also send information to the driver part 66 of the network manager 72 using data path 89.

- 15 When a data packet comes from the NDIS 63 to the miniport NDIS 64 using data path 81, it is automatically stored into the buffer 65. The second thread 67 of the executable application 73 is then warned that a data packet is ready to be processed and gets the data packet from the driver part 66 of the network manager 72 using path 88 and save it to buffer 68. The second thread 67 then sends a message to the main thread 69. The main thread 69 collects the data packet from buffer 68 of the network manager 72. The main thread 69 transforms the data packet into a format suitable for the data radio system 71. In another embodiment, the main thread 69 encrypts the data part of the TCP/IP packet for security and/or authentication purposes. In another embodiment, the main thread 69 compress the data part of the TCP/IP packet. When the TCP/IP is entirely processed, the new packet is sent to the interface 70. The interface 70 then sends the information to the radio system 71.

- 20 When a wireless packet is received in the radio system 71, it is sent to the interface 70. The main thread 69 then collects the wireless packet using data path 98. The main thread 69 then deletes the wireless header. In another

embodiment, the main thread 69 then decompresses the data of the wireless packet. In another embodiment, the main thread 69 then decrypts the data of the wireless packet. The main thread 69 then creates a TCP/IP packet with the data. This TCP/IP packet is sent to the driver part 66 of the network manager 72. This

- 5 TCP/IP packet is then sent to the buffer 65. The NDIS 64 then retrieves the TCP/IP packet from the buffer 65 using data path 83. The NDIS 64 can then send the TCP/IP packet to the NDIS 63.

What is claimed is:

1. A gateway for transmitting data packets between a wireless network and a second network, the gateway comprising:

    a database comprising data associating at least one wireless terminal with at least one destination address, said data including for each of said at least one wireless terminal at least one wireless terminal identifier, at least one source address of said wireless terminal according to a protocol of said second network, and at least one destination address on said second network;

    a database manager collecting information from said data packets received from said at least one wireless terminal in order to build up and maintain said database;

    a header builder receiving data packets from the wireless network without a header suitable for said protocol of said second network and building said suitable header based on said data and information contained within said data packets received, and outputting data packets with said suitable header for transmission on said second network; and

    a relay module receiving data packets from said second network addressing said at least one wireless terminal according to an address associated with said second network, said relay module retransmitting said data packets from said second network to said at least one wireless terminal using an address obtained from said database in a format of a protocol of said wireless network.

2. The apparatus as claimed in claim 1 wherein said database manager responds to request messages from said at least one wireless terminal, said request messages comprise information about the communication.

3. The apparatus as claimed in claim 2 wherein the response to said request messages allocates an Identification Number (ID), and said header builder reads said ID to determine the header information, said ID being sent to said wireless terminal.

4. The apparatus as claimed in claim 2 wherein said ID has at least a Sub Identification Number (Sub-ID), said Sub ID being used when many of said destinations are being simultaneously managed with a single ID in order to for said at least one destinations to be distinguished.

5. The apparatus as claimed in claim 1 wherein said database manager only stores one of said destination address per terminal, and automatically builds data from said header information received, said packets received with said header information being forwarded without said wireless header on said second network, said header converter building said header information for said destination address for subsequent packets not having said header information.

6. The apparatus as claimed in claim 1 wherein said protocol used at said second network is TCP/IP.

7. The apparatus as claimed in claim 1 wherein said relay module communicates said header into said wireless terminal using said database data and strips headers information from said packets sent to said wireless terminal.

8. The apparatus as claimed in claim 7 wherein said relay module compresses said data packets prior to transmission to said wireless terminal.

9. The apparatus as claimed in claim 7 wherein said relay module encrypts said data packets prior to transmission to said wireless terminal.

10. The apparatus as claimed in claim 7 wherein said relay module compresses said data and information contained within said data packets to be transmitted over said wireless network.

11. The apparatus as claimed in claim 7 wherein said relay module encrypts said data and information contained within said data packets to be transmitted over said wireless network.

12. The apparatus as claimed in claim 7 wherein said relay module encrypts said data and information contained within said data packets to be transmitted over said wireless network using a public/private keying scheme.

13. A wireless terminal for transmitting wireless packets over a wireless network, said wireless terminal comprising:

- a header manager transmitting header information for a particular destination on a second network, and said wireless packets to said wireless network without a header suitable for a protocol used on a second network;
- a memory comprising data representing header information concerning at least one second network terminal;
- a memory manager collecting information from said wireless packets received from said wireless network in order to build up and maintain said memory;
- a relay module collecting said data packets, not having a header suitable for said protocol, from said wireless network to build a data packet with a header suitable for said protocol using said data.

14. The apparatus as claimed in claim 13 wherein said memory manager requests response messages from said wireless packets.

15. The apparatus as claimed in claim 14 wherein the response messages to said mobile terminal gives an Identification Number (ID), and said header converter reads said ID to determine the header info.

16. The apparatus as claimed in claim 15 wherein said ID has a sub identification number (Sub-ID), when many of said destinations are being simultaneously managed.

17. A method for sending a data packet from a wireless terminal to a second network via a wireless network, said method comprising the steps of:

    sending header information from the wireless terminal,

    removing said header of said data packet to provide a data part of said data packet,

    adding to said data part of said data packet a wireless header to provide a wireless packet,

    transmitting said wireless packet over said wireless network,

    receiving said wireless packet and removing said wireless header of said wireless packet to provide said data part of said wireless packet,

    creating a header for said data part using said header information received and according to a protocol of said second network,

    adding said header created to said data part of said wireless packet to provide a new packet, and

    sending said new packet on said second network.

18. A method for sending a data packet from a second network to a wireless terminal via a wireless network, said method comprising the steps of :

    sending header information from said second network to said wireless terminal,

    removing said header of said data packet to provide a data part of said data packet,

adding to said data part of said data packet a wireless header to provide a wireless packet,

transmitting said wireless packet over said wireless network,

receiving said wireless packet and removing said wireless header of said wireless packet to provide said data part of said wireless packet,

creating a header for said data part using said header information received by said wireless terminal and according to a protocol used at said wireless terminal, and

adding said header created to said data part of said wireless packet to provide a new packet in said protocol.

## ABSTRACT

A gateway for a wireless network. The gateway allows any wireless device to communicate using the Internet Protocol. The radio gateway works as an agent between the NDIS layer and the wireless network. The gateway removes the TCP/IP header and add its own header.

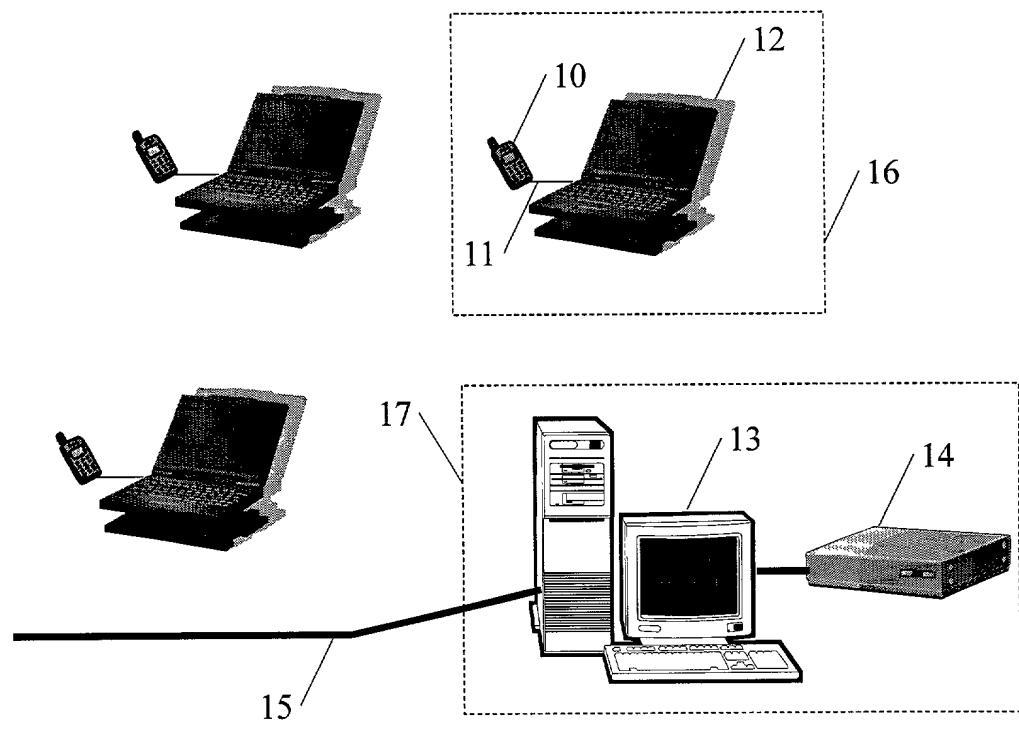
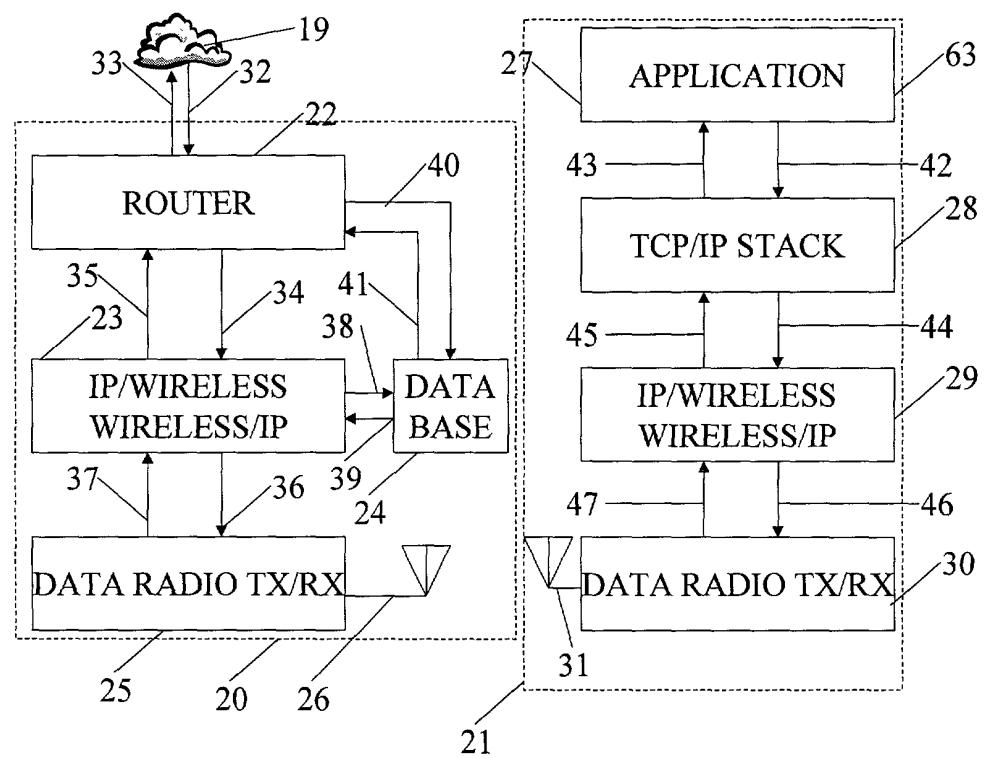
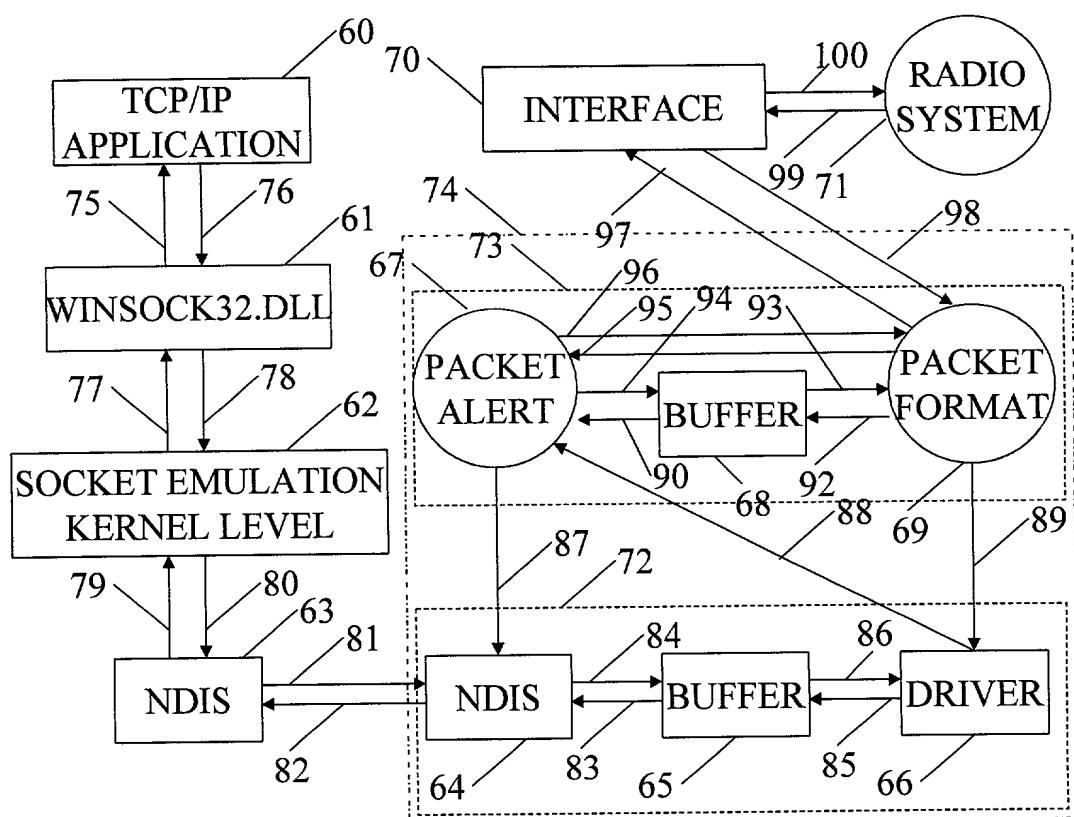


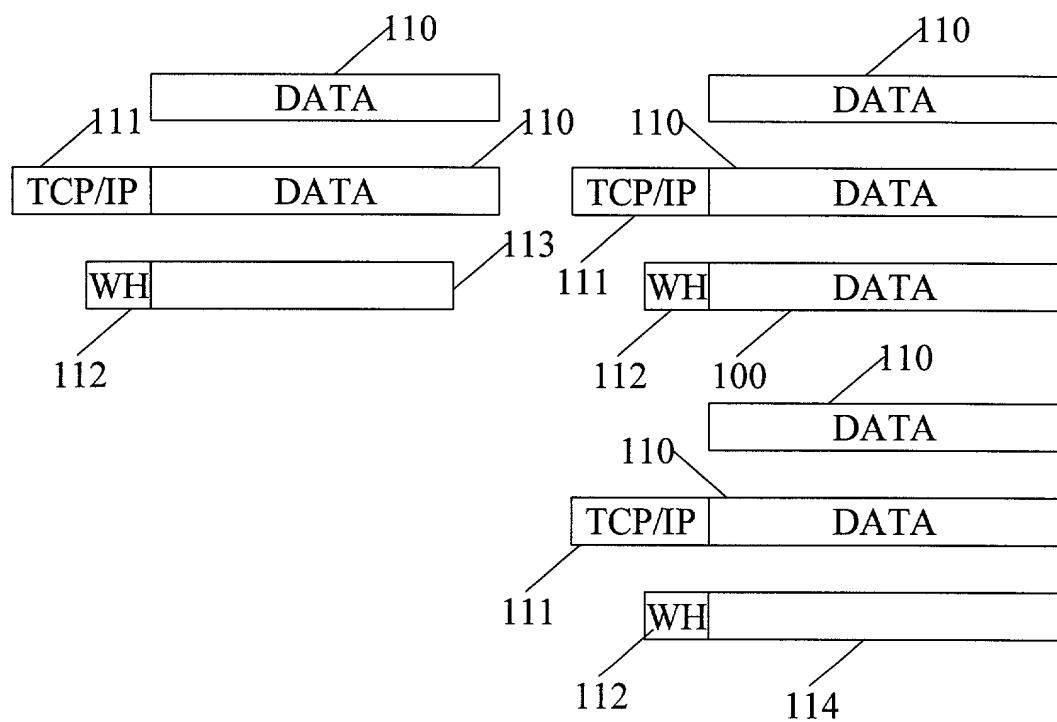
Fig 1



**FIG 2**



**FIG3**



**FIG4**

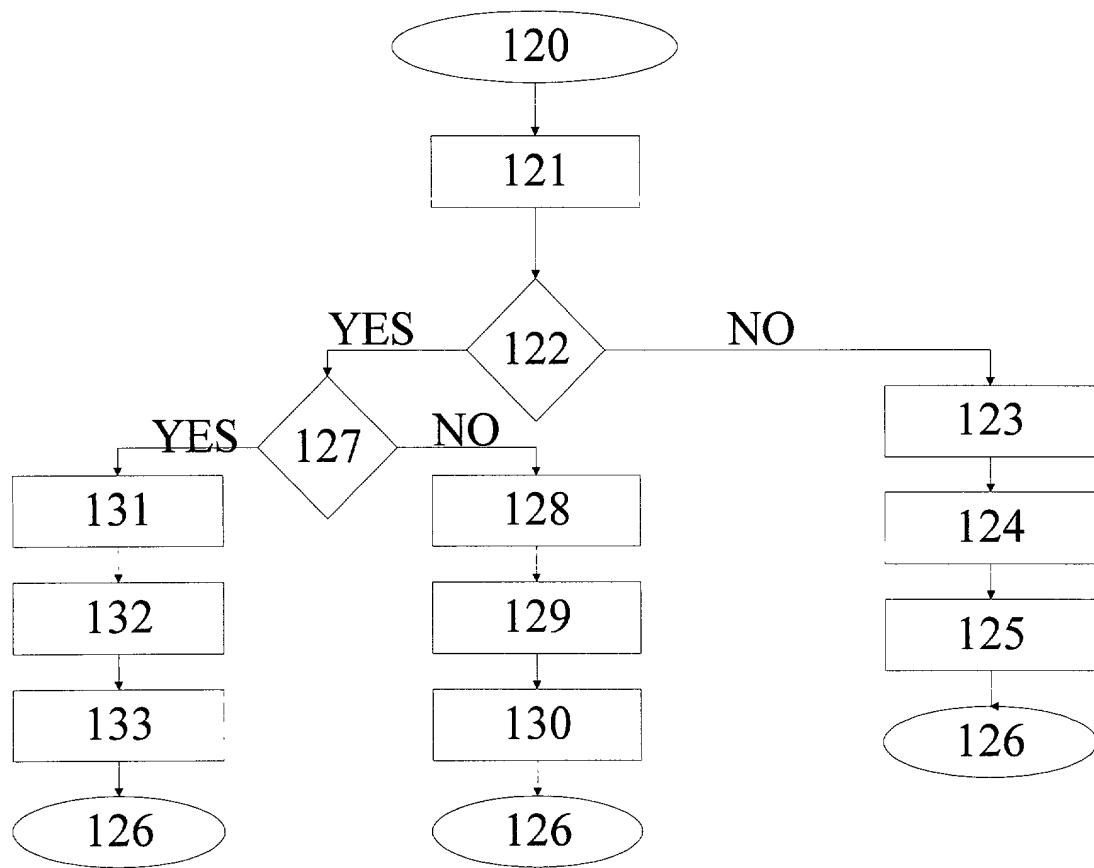
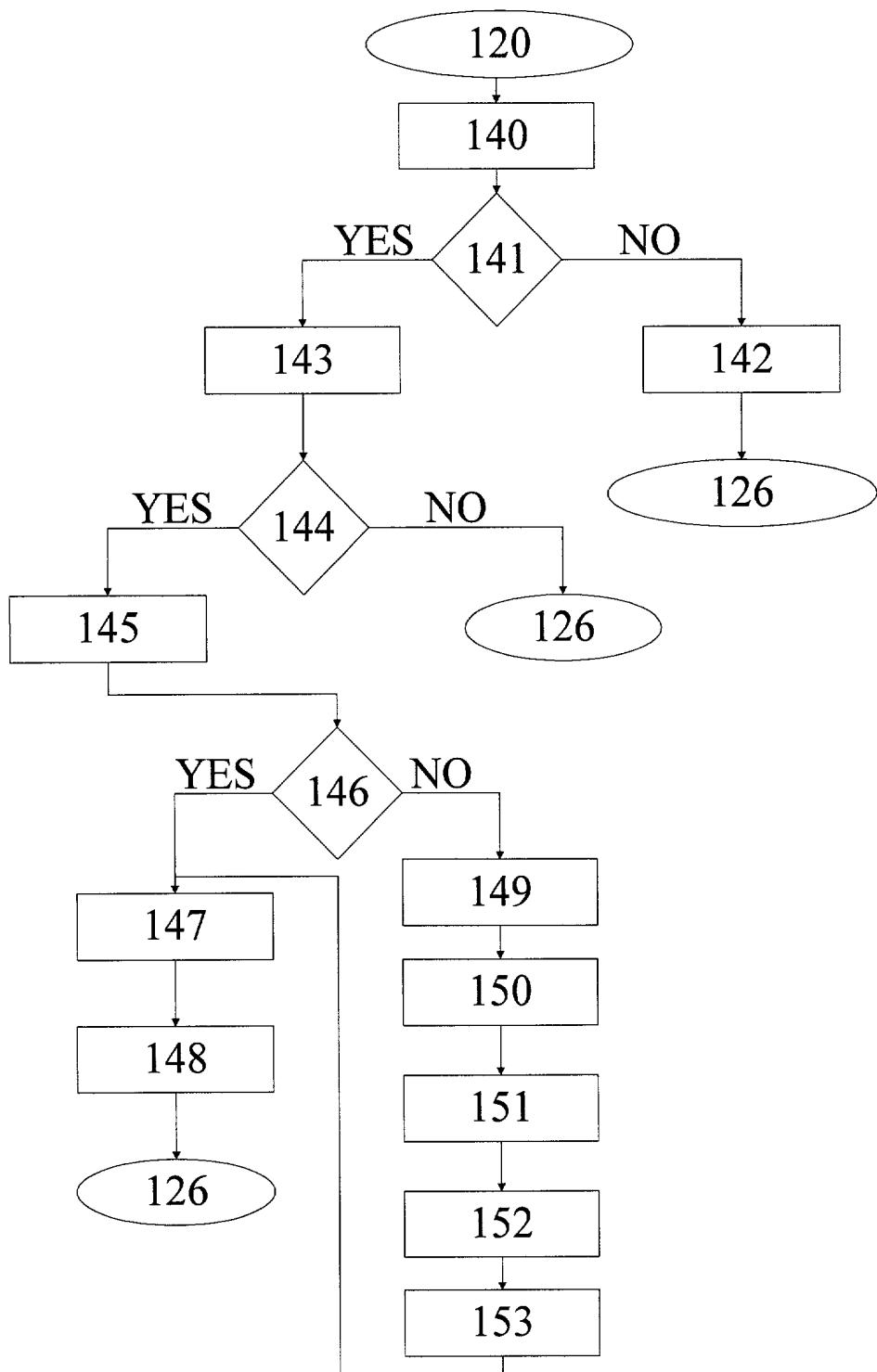


FIG5



**FIG6**

160

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164

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166

ID NUMBER	TCP/IP ADDRESS	PHYSICAL ADDRESS
1001	203.204.205.206	123456789

Sub ID	DEST TCP/IP ADDRESS	SOURCE PORT	DEST PORT
0001	204.25.23.2	1014	23
0002	128.52.3.54	1020	21

FIG7

# Declaration and Power of Attorney for Patent Application

## Déclaration et Pouvoir pour Demande de Brevet French Language Declaration

En tant qu'inventeur ci-après désigné, je déclare par la présente que:

Mon domicile, mon adresse postale et ma nationalité sont tels que figurant ci-dessous à côté de mon nom.

Je crois être le premier inventeur original et unique (si un seul nom est mentionné ci-dessous), ou l'un des premiers co-inventeurs originaux (si plusieurs noms sont mentionnés ci-dessous) de l'objet revendiqué, pour lequel une demande de brevet a été déposée concernant l'invention intitulée

### "WIRELESS COMMUNICATION WITH HEADER SUPPRESSION AND RECONSTRUCTION"

et dont le mémoire descriptif est ci-joint à moins que la case suivante n'ait été cochée:

a été déposée le \_\_\_\_\_ sous le numéro de demande des États-Unis ou le numéro de demande internationale PCT \_\_\_\_\_ et modifiée le \_\_\_\_\_ (le cas échéant).

Je déclare par la présente avoir révisé et compris le contenu du mémoire descriptif ci-dessus mentionné, incluant les revendications, telles que modifiées par toute modification ci-dessus mentionnée.

Je reconnaiss devoir divulguer toute information pertinente à la brevetabilité, tel que défini dans le Titre 37, §1.56 du Code fédéral des réglementations.

Je revendique par la présente la priorité étrangère, en vertu du Titre 35, §119(a)-(d) ou §365(b) du Code des États-Unis, sur toute demande étrangère de brevet ou certificat d'inventeur ou, en vertu du Titre 35, §365(a) du même Code, sur toute demande internationale PCT désignant au moins un pays autre que les États-Unis et figurant ci-dessous et, en cochant la case, j'ai aussi indiqué ci-dessous toute demande étrangère de brevet, tout certificat d'inventeur ou toute demande internationale PCT

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

### "WIRELESS COMMUNICATION WITH HEADER SUPPRESSION AND RECONSTRUCTION"

the specification of which is attached hereto unless the following box is checked:

was filed on \_\_\_\_\_ as United States Application Number or PCT International Application Number \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations., §1.56.

I hereby claim foreign priority under Title 35, United States Code, §119(a)-(d) or §365 (b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, listed below, and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application

## French Language Declaration

ayant une date de dépôt précédant celle de la demande à propos de laquelle une priorité est revendiquée.

Prior foreign application(s)  
Demande(s) de brevet antérieure(s)

on which priority is claimed.

Priority Not Claimed  
Droit de priorité non revendiqué

(Number)  
(Numéro)

(Country)  
(Pays)

(Day/Month/Year Filed)  
(Jour/Mois/Année de dépôt)



(Number)  
(Numéro)

(Country)  
(Pays)

(Day/Month/Year Filed)  
(Jour/Mois/Année de dépôt)



Je revendique par la présente tout bénéfice, en vertu du Titre 35, §119(e) du Code des États-Unis, de toute demande de brevet provisoire effectuée aux États-Unis et figurant ci-dessous.

(Application No./ N° de demande)

(Filing Date/ Date de dépôt)

(Application No./ N° de demande)

(Filing Date/ Date de dépôt)

Je revendique par la présente tout bénéfice, en vertu du Titre 35, §120 du Code des États-Unis, de toute demande de brevet effectuée aux États-Unis, ou en vertu du Titre 35, §365(c) du même Code, de toute demande internationale PCT désignant les États-Unis et figurant ci-dessous et, dans la mesure où l'objet de chacune des revendications de cette demande de brevet n'est pas divulgué dans la demande antérieure américaine ou internationale PCT, en vertu des dispositions du premier paragraphe du Titre 35, §112 du Code des États-Unis, je reconnais devoir divulguer toute information pertinente à la brevetabilité, tel que défini dans le Titre 37, §1.56 du Code fédéral des réglementations, dont j'ai pu disposer entre la date de dépôt de la demande antérieure et la date de dépôt de la demande nationale ou internationale PCT de la présente demande:

(Application No.)  
(N° de demande)

(Filing Date)  
(Date de dépôt)

(Status) (patented, pending, abandoned)  
(Statut) (breveté, en cours d'examen, abandonné)

(Application No.)  
(Date de dépôt)

(Filing Date)  
(Statut)

(Status) (patented, pending, abandoned) (N° de demande)  
(breveté, en cours d'examen, abandonné)

## French Language Declaration

Je déclare que toutes les déclarations faites dans la présente sont à ma connaissance, véridiques et que toutes les déclarations faites à partir de renseignements ou de suppositions sont tenues pour véridiques; et de plus, que toutes ces déclarations ont été faites en sachant que toute fausse déclaration volontaire ou son équivalent est passible d'une amende ou d'une peine d'emprisonnement, ou des deux, en vertu de la Section 1001 du Titre 18 du Code des États-Unis, et que de telles déclarations volontairement fausses risquent de compromettre la validité de la demande de brevet ou du brevet délivré à partir de celle-ci.

**POUVOIR:** En tant qu'inventeur désigné, Je nomme par la présente l'(les) avocat(s) et/ou agent(s) inclus sous le numéro de client officiel suivant, avec plein pouvoir de révocation et de substitution, chargés de poursuivre cette demande et de traiter toute affaire s'y rapportant avec l'Office des brevets et des marques: *(mentionner le nom et le numéro d'enregistrement)*.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**POWER OF ATTORNEY:** As a named inventor, I hereby appoint the agents and/or attorneys included in the following Customer Number, with full power of substitution, association, and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: *(list name and registration number)*

Please send all correspondence and direct all telephone calls to: / Veuillez adresser toute correspondance et tout appel téléphonique à:



**020988**

PATENT AND TRADEMARK OFFICE

Full name of sole or first inventor (Nom complet de l'unique ou premier inventeur) <b>Yvon BERGERON</b>	Citizenship (Nationalité) <b>Canadian</b>	Date (dd/mm/yyyy) (jj/mm/aaaa)
Residence and Post Office address (Domicile et adresse postale)	Inventor's signature (signature de l'inventeur)	
Full name of second inventor (Nom complet du second co-inventeur)	Citizenship (Nationalité)	Date (dd/mm/yyyy) (jj/mm/aaaa)
Residence and Post Office address (Domicile et adresse postale)	Second Inventor's signature (signature du second inventeur)	
Full name of third co-inventor (Nom complet du troisième co-inventeur)	Citizenship (Nationalité)	Date (dd/mm/yyyy) (jj/mm/aaaa)
Residence and Post Office address (Domicile et adresse postale)	Third Inventor's signature (signature du troisième inventeur)	
Full name of fourth co-inventor (Nom complet du quatrième co-inventeur)	Citizenship (Nationalité)	Date (dd/mm/yyyy) (jj/mm/aaaa)
Residence and Post Office address (Domicile et adresse postale)	Fourth Inventor's signature (Signature du quatrième inventeur)	